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also, that the copperplate so produced is extremely tough and uniform in thickness, and that its formation proceeds very rapidly.

Chemical Laboratory,
Charing Cross Hospital.

GEORGE FOWNES.

No. II.

PROCESS FOR ASSAYING THE ORES OF MANGANESE.

The ***GOLD ISIS MEDAL*** *was presented to Mr.* ***LEWIS THOMPSON****, Royal Polytechnic Institution, for the following Communication on his Process for Assaying the Ores of Manganese.*

GENTLEMEN,

ALTHOUGH the Ores of Manganese constitute so important a feature in the mining interests of this country, yet we have not at the present day any method by which these ores can be correctly assayed so as to determine their value for commercial purposes. At first sight it would appear that this object might easily be obtained by heating a given portion of the ore, and collecting the oxygen gas disengaged by the action of the heat, the quantity of gas indicating the quantity of peroxide, and, consequently, the value of the ore; but not only does the peroxide of manganese give off oxygen when heated, but the sesquioxide and red oxide are also decomposed by heat, according to the degree of temperature and other circumstances not well understood, so that the substance remaining in the retort may be protoxide, red oxide, or sesquioxide of manganese, or a mixture of these three in proportions which vary with each experiment, so that it is almost impossible to obtain two assays exactly alike from any given sample of ore. By using sulphuric acid with the ore the difficulty is not removed; for I have boiled strong sulphuric acid upon manganese ore until it distilled in drops from the beak of the retort; and yet, on adding water and chloride of sodium, a copious evolution of chlorine took place, proving that the decomposition of the ore was incomplete. As oxalic acid is resolved by the action of the ores of manganese into carbonic acid gas, this has been proposed as a means of determining their value; but the decomposition is never perfect, and peroxide of iron, which almost always exists in these ores, has also the property of decomposing oxalic acid with the evolution of carbonic acid, so that this process is useless, independently of the difficulty of collecting the gas. As a correct mode of assaying these ores was of some consequence to me, I commenced a set of experiments to discover ore, which would answer in all cases; and it may, perhaps, save some trouble to others if I detail here a few of my many unsuccessful attempts. The experiments were conducted with great care, and repeated several times. Muriatic acid and manganese ore were mixed together, and a piece of one of the following metals, carefully weighed, was introduced:—

	Hot.	Cold.
Antimony	chlorine evolved, metal slightly acted on	the same.
Mercury	ditto	ditto.
Copper	ditto	very slight action.
Lead	ditto	ditto.
Silver	ditto	ditto.
Amalgam of tin	chlorine and hydrogen evolved—action on both metals.	slight action—chlorine evolved.

The following metals were acted on with strong sulphuric acid and peroxide of manganese:—

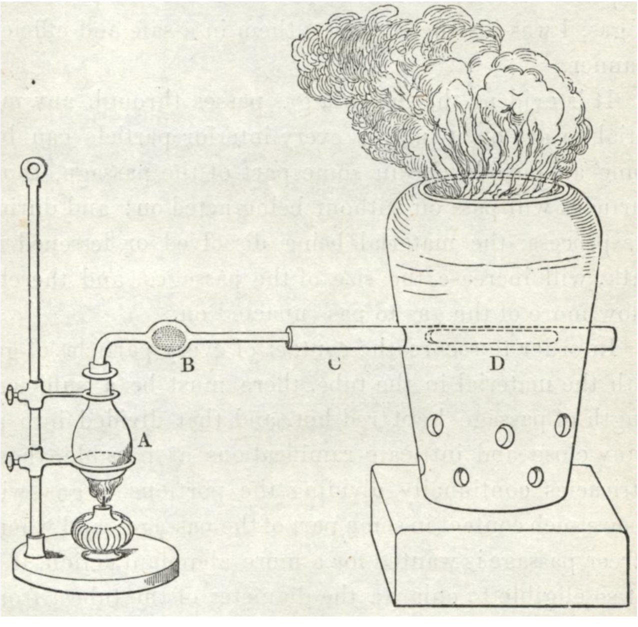
	Hot.	Cold.
Silver	oxygen given off	no action.
Lead	ditto	ditto.
Mercury	oxygen and sulphurous acid given off	ditto.
Copper	ditto	slight action.

Greatly disappointed at my numerous failures, I at last hit upon the mode which forms the subject of my present paper, and which I have convinced myself, by repeated experiments, is exceedingly accurate and certain in effect, and easy of execution. It possesses, moreover, this advantage, that it is similar to the plan which the bleacher or manufacturer uses in his ordinary processes. The assay is, therefore, practically correct; for whatever the value of the ore found by this plan may be, such, and no more, must be its value to the manufacturer. The method which I employ is the following:—

A fair sample of the ore to be assayed is reduced to powder; one hundred grains of this are then introduced into a flask, provided with a bent tube in which a bulb is blown, as shewn in the figure: this bulb is partly filled with marble in fragments; one and a half or two ounces of strong muriatic acid are then poured upon the ore, and the tube being adapted, a gentle heat is applied, and the chlorine thus produced is driven along the glass tube, and through a red hot earthenware tube containing a coil of thin sheet copper previously weighed; the copper is acted on by the chlorine, and a portion of it is volatilised as perchloride of copper. When chlorine ceases to form in the flask, the mixture is to be boiled until a portion of muriatic acid distils over into the bulb, where it decomposes the marble, and the carbonic acid thus formed, traversing the red hot tube, drives before it the last portions of chlorine, which are thus made to act upon the red hot copper. The whole is now allowed to cool a little, and the copper removed, washed, dried, and weighed, the loss of which determines the percentage of peroxide in the ore, every sixty-four parts of copper indicating eighty-eight parts of peroxide of manganese.

I am, Gentlemen, &c. &c.

To the President, &c. LEWIS THOMPSON.
of the Society of Arts, &c.



A. Flask containing manganese ore and muriatic acid.
B. Bulb and glass tube containing marble.
C. Earthenware tube passing through furnace.
D. Coil of copper foil previously weighed.

The following Paper is published as an Appendix to Mr. THOMPSON'S *Communication.*

THE Society having bestowed two rewards for chemical processes requiring the use of red hot tubes, it may be useful at this time to draw attention to the conditions requisite for obtaining the full effect with such tubes, and to describe the means that have been used successfully to avoid the dangers which have been incurred by using such tubes for other purposes. Having had, early in life, frequent occasion to use red hot tubes for the production of gas, I was instructed to use them in a safe and efficient manner.

It is evident that when a gas passes through any material to act on it, unless every interior particle can become an outside one in some part of the passage, those particles will pass on without being acted on; and during the process, the material being dissolved or lessened in bulk, will increase the size of the passages, and thereby allow more of the gas to pass unacted on.

In order to secure the contact of every particle of gas with the material in the tube, there must be a sufficient length of passage kept red hot, and that divided into as many close and intricate ramifications as possible, those intricacies continually dividing the portions of gas, will ensure such contact in some part of the passage; and where a freer passage is wanted for a more abundant action, it is not so eligible to enlarge the diameter of the tubes, from the difficulty there would be in keeping the central portion quite hot: but the purpose may be answered by using coarser materials and making a much longer portion of the tube red hot. Again, when the process is to be continued for a considerable time, we must provide, that as fast as any portion of the material disappears, other portions shall be ready to fall in and take its place, so as to securely fill every avenue.

Now, I think it will be seen that the ordinary mode of laying a straight tube horizontally across the fire will not answer these conditions, for directly the material is acted on it becomes diminished in bulk, and that alone will open the passages; but the material lying on the lower side will leave clear room above for the gas to pass over it without contact. If metal foil is used, its thinness will enable it to be rolled close at the centre, but it will soon give room above for the gas to pass without action; if it is thick enough to hold out and fill the circumference, its central parts will be too open, so that it does not appear that complete action can be secured in a horizontal tube, and yet, for analysis, complete action is indispensable.

But if we place the tube vertically with a perforated plug just below the red hot part, and provide a number of metal slips, cut taper like nails, and nearly as long as the red hot part of the tube, and first fill the lower portion with as many as it will hold, the thick ends downwards, and then follow them with as many with their points downwards, they will wedge in between each other, and thus completely divide the spaces into very narrow passages, and will keep them so by falling in as fast as any room is made. Again, if the metal is cast into small shot, and the tube filled a little higher than the red hot portion, there will be plenty to fall in and keep the avenues so effectually divided that any analysis so performed may be depended on.

Red hot tubes have long been used for the production of gas, and serious accidents have occurred with them. The celebrated chemist Lavoisier, whilst producing carburetted hydrogen, had an explosion, by which several persons were killed and others wounded; another chemist had a similar accident with less mischief; and a third case occurred with myself about the year 1799, at the Middlesex Hospital. Whilst I was producing carburetted hydrogen, the apparatus burst, and wounded five gentlemen among the audience, who were attending the lecture. My late uncle, Mr. S. Varley, for whom I was operating, perceived the cause, and ever after removed it, and used to explain the cause when lecturing on those gases. In all these cases, one chemist had followed the other in laying the tube sufficiently filled with materials horizontally across the fire; in our case, a gun-barrel, well filled with charcoal powder, was laid across the fire, and for the sake of rendering the process visible, the water was made to boil in a glass retort connected by a metal tube with the gun-barrel, and from the other end a tube proceeded to the pneumatic trough. At first there was a plentiful decomposition of the steam, for the gas came freely over; but after a while it slackened, and not knowing the cause, I urged the fire, when suddenly the apparatus burst, and shattered the glass about the room, wounding five of the audience.

The cause was thus explained during the operation; the red hot charcoal decomposed the steam, and combining with it, went over in the form of gas; the charcoal continued to diminish in bulk, by which it soon left room enough for some of the steam to pass over without decomposition, which condensed in the farther end of the barrel and choked the passage through the charcoal that was in that end to such an extent that the gas could not escape as fast as it was produced : this occasioned considerable pressure within, which caused a still quicker decomposition, till it burst the apparatus.

The extra charcoal was put in to hold up the red hot portion. If no more had been put in than was made red hot, the first production of gas would have been liable to distribute it so as to leave room above for the passage of steam with but little decomposition, and then, with apparent safety, there would have been a very unsatisfactory supply of gas.

In all subsequent cases the finer parts of the charcoal were removed by sifting, in order to ensure a freer passage of the gas, and enable us to fill the barrel quite full to suit with a new arrangement, in which the barrel was placed upright in a high fireplace. For this purpose we had German stoves, made with much deeper cast-iron lining than usual; a round hole was made in the top, or cover, for the top of the gun-barrel to rise through, and a hole was cast in the middle of the grating to let the lower end through, and an angular tube was fitted to it in the ash pit, through which the steam entered. The gun-barrel being thus placed upright, and brim full of granular charcoal free from dust, was kept red hot at the lower half, the steam rising through the intricate ramifications of this long portion of red hot charcoal was completely decomposed into carburetted hydrogen and carbonic oxide, and as fast as it dissolved the charcoal into gas, the upper portion continued falling down into its place, and kept that red hot portion quite full. Thus a continuous and rapid supply of gas was secured as long as there was any spare charcoal to fall down, after which a diminishing supply warned us to leave off, or else to refill the tube with charcoal, and we never after had any explosion.

CORNELIUS VARLEY.

1 *Charles Street, Clarendon Square,*
October, 1841.

No. III.

PREPARED VEGETABLE JUICES.

The SILVER MEDAL was presented to Mr. EDWARD BENTLEY, 41 *Moorgate Street, for the following Communication on his Method of obtaining the more Powerful Vegetable Preparations for Medical Use. Samples of the Juices are deposited in the Society's Repository.*

AT the present time a difference of opinion exists as to the best method of administering the more Powerful Vegetable Preparations of the Materia Medica.

Most practitioners, I believe, are willing to concede that the Extracts and Tinctures, as at present prepared, are not uniform in their action ; and that not unfrequently their skill is frustrated by the inadequacy of the preparation they administer.

I am aware that the dried powder of the leaves is by some persons considered to possess the whole properties of the plant ; and I do not doubt that when the powder is fresh it may do so : but it is essential to bear in mind that light acts as a decomposing agent, and that much precaution is necessary to prevent chemical action dissipating the principle upon which its efficacy depends.